

# EHTP: Improving Health Quality through Health Technology

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**Abstract-Providing health care effectively and efficiently involves putting together a great variety of resource inputs. Inputs or health technologies (HT) are human and physical resources - facilities and equipment, and consumables including pharmaceuticals. In the complex health system environment, this wide range of technologies and related interventions produce an extraordinary array of different service outputs. The World Health Organization (WHO) embarked in mid-1990s on a major research and development initiative to design a methodology and tool that would allow for optimal, rational and systematic planning and management of healthcare technology interventions. These efforts culminated in the development of the Essential Healthcare Technology Package (EHTP), which has since been successfully applied in countries and by several WHO Technical Programs.**

## I. INTRODUCTION

Health technology management (HTM) has to address and integrate all elements of the HTM cycle – provisioning, acquisition and utilization. EHTP is a resource planning methodology and tool that provides guidance on an adequate mix of HT needed for key healthcare interventions that is specific and particular to the local needs and conditions. EHTP integrates healthcare needs, disease profiles, patient demographics, clinical practice, technology requirements, availability and constraints, and system capacity for its management. It then links these to the HT resources needed to deliver a defined set of health interventions.

EHTP addresses a wide spectrum of HT comprising human resources, medical devices, pharmaceuticals and health facilities. The EHTP methodology is based on the premise that effective and efficient healthcare delivery depends on the availability of a right mix of HT required for delivery of specific health interventions; and that these HT are carefully chosen with due consideration of recurrent implications of a capital investment, and system's capacity for their adequate utilization.

In EHTP, HT are integrated with specific interventions; they are then quantified and classified with detailed technology unit costs, time utilization and mode of administration so that informed decisions can be made on their optimal acquisition, deployment, and utilization. This

essentially is the core of EHTP aimed at ensuring that technology adequately bears on equity, quality, safety and efficiency in health service delivery.

EHTP is uniquely intervention-based; scenarios form processes and pathways of linked clinical interventions. These scenarios are interlinked with standard disease and procedure classifications, and clinical practice guidelines. Technology resource requirements are then simulated for each particular clinical scenario using patient demographic and coverage data entered into the EHTP simulation tool. EHTP allows users to link all possible resource information necessary to perform a defined set of health interventions. It also allows for a comprehensive technology GAPs analysis between the current country practices and intended global best practices based on evidence-based medicine (EBM).<sup>1</sup>

## II. DEVELOPMENT, COVERAGE, STATUS QUO

EHTP was developed through the Medical Research Council (MRC) of South Africa, beginning in 1994. Through frustrations with challenges with WHO's more static Essential Lists used in HTM planning, international and South African grants for a more dynamic planning and management process was developed through MRC in 1996 and 1997. From 1996-1999, MRC conducted methodology development, and linking of various clinical procedures. There was a WHO workshop in Geneva in 2000 to train international HTM experts on EHTP, preparing them to assist in country implementation. WHO also provided further grants for EHTP development beginning in 2000. From 2002-2006, EHTP has been incorporating global clinical practice guidelines (CPGs) from WHO's Making Pregnancy Safer (MPS) Health Package/Technical Program, 55 EBM CPGs for primary and secondary levels for routine care and typical complications. A similar process for mapping WHO's Integrating Management of Childhood Illnesses (IMCI) into EHTP began in 2005, for 118 more EBM CPGs. MPS/IMCI CPGs are noted in Tables 1-2.<sup>2</sup>

EHTP implementation sites have included the following:

- 1) Kyrgyzstan 2001
- 2) Mozambique 2001
- 3) Namibia 2002
- 4) China 2002
- 5) South Africa 2002
- 6) Ukraine 2003
- 7) WHO internal Technical Programs
  - MPS 2002
  - IMCI 2005
- 8) Senegal 2005
- 9) Mexico 2005
- 10) Tsunami sites 2005

EHTP technical status quo includes the following: methodology and concept developed; 3<sup>rd</sup> version of software packages released; support infrastructure established; ten

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years of experience in development and country implementation; and strong interagency collaboration.

TABLE I  
MAKING PREGNANCY SAFER CLINICAL PRACTICE GUIDELINES

Level	MPS CPGs: Routine and Complications in Perinatal Care
P/S	Routine antenatal care (1st visit)
P/S	Routine antenatal care (2nd visit)
P/S	Routine antenatal care (3rd visit)
P/S	Routine antenatal care (4th visit)
P/S	Severe anemia in pregnancy
P/S	STIs and RTIs in pregnancy
P/S	Mild pre-eclampsia
P/S	Malaria in pregnancy
P/S	HIV in pregnancy
P/S	Antenatal infection
P/S	Routine labor and delivery
P/S	Obstructed labor
P/S	Antepartum hemorrhage
P/S	Postpartum hemorrhage
P/S	Sepsis in pregnancy
P/S	Pre-eclampsia
P/S	Eclampsia
P/S	Fetal distress
P/S	Caesarean section
P/S	Routine postpartum care
P/S	Postpartum family planning
P/S	Postpartum infection
P/S	Routine newborn care
P/S	Low birth weight
P/S	Birth asphyxia
P/S	Newborn infection

Primary (P=clinic level) & Secondary (S=hospital level) care

TABLE 2  
IMCI EXAMPLE CLINICAL PRACTICE GUIDELINES

Level	Childhood Illnesses
P/S	Pneumonia, Cold, Bronchiolitis, Croup
P/S	Diphtheria, TB, Typhoid Fever, Pertussis
P/S	Malnutrition, Dehydration, Dysentery, Diarrhea
P/S	Meningitis, Malaria, Dengue Fever, Measles
P/S	Otitis Media, Hypothermia, Heart Failure, UTI
P/S	Child HIV, PCP, Burns, Head injuries, Fractures

### III. FEATURES OF EHTP

EHTP software includes the following features: a reference database on medical devices, pharmaceutical, human resources and facilities; a link to databases for clinical and non-clinical interventions; modelling of resources based on the integration of health interventions and technologies; the ability to model work loads and constraints; the ability to comprehensively cost health interventions; and the ability to do Gaps analysis.

Database, other technical features, and applications:  
*Medical Devices:* include a reference database containing more than 7000 types of medical devices; unit costs;

maintenance requirements; criticality; incorporation of utilization times; and scheduling times. *Pharmaceuticals:* include a database containing more than 2500 of pharmaceuticals; unit costs; route of administration; drug scheduling; and dosage. *Clinical Guidelines:* include graphical representation of clinical practice; full editor to map guidelines; WHO-MPS Guidelines fully mapped; and modelling of ideal and real guidelines. *Health Package Modelling:* include modelling of coverage, patient load, and epidemiological profiles; hospital admission data; trends; and scaling up. *Simulation of Resources:* includes time modelling taking into consideration health package profiles; constraints; technology dependency; and trends and coverage. *Typical Applications:* includes Static Healthcare Technology Lists; Dynamic Healthcare Technology Lists; Rapid development of Standard Equipment Lists; Staff norms, skills and competencies requirements; Costing of Interventions; and Gaps analysis. *Key EHTP Applications:* accelerate health reform and development of health quality-HQ infrastructure; optimize health technology-HT resource planning and utilization by health providers; cost key health interventions to determine best HT investment; calculate recurrent costs (device maintenance), and other key HT management indicators; and use HT performance data to drive evidence-based clinical practice and improved HQ

### IV. QUALITY AND HTM IMPROVEMENTS THROUGH EHTP

There have numerous HQ and HTM improvements in the first six countries where EHTP has been implemented. These are categorized and shown in Tables 3A and 3B.<sup>3</sup>

### V. CONCLUSIONS

EHTP has proven itself as a health resource planning and management tool, particularly important for developing countries with limited health resources.

It has multifunctional capabilities – addressing issues of quality, cost, and efficiency. EHTP has progressively become the tool of choice for Ministries of Health on four continents to tackle challenging health resource issues, as evidenced by its adoption by the global WHO Technical Programs for Making Pregnancy Safer and Integrating Management of Childhood Illnesses, and its ability to accurately calculate healthcare interventions costs.

### REFERENCES

- [1] P. Heimann, and A. Issakov, “WHO EHTP 2006 Status Report”, May 2006, Geneva.
- [2] P. Heimann, T. Judd, and A. Issakov, “WHO EHTP Update”, May 2005, Tampa.
- [3] T. Judd, “EHTP: Improving Health Quality Through Evidence-Based Use of Health Technology”, May 2005, Tampa.

TABLE 3A  
EHTP HEALTH QUALITY AND HTM IMPACTS

Site	Objectives and HQ/HTM Results
Kyrgyzstan 2001-2004	<p><b>Accelerate health reform and health quality (HQ) infrastructure development:</b></p> <p><i>Databases</i></p> <ul style="list-style-type: none"> <li>National health resource databases standardized</li> </ul> <p><i>EBM</i></p> <ul style="list-style-type: none"> <li>Facilitated use of EBM improving HQ</li> </ul> <p><i>CPGs</i></p> <ul style="list-style-type: none"> <li>Over 120 CPGs approved by MOH at 3 levels</li> <li>Mapped, validated, increased compliance</li> </ul> <p><i>Human Resources</i></p> <ul style="list-style-type: none"> <li>More family practice staff identified/trained</li> <li>Clarified MD/nurse responsibilities</li> </ul> <p><i>Drugs</i></p> <ul style="list-style-type: none"> <li>Removed VAT fees for externally purchased</li> <li>Developed MoH rules allowing drugs sold at sites where local pharmacies not available</li> <li>Improved handling of donated drugs</li> </ul> <p><i>Facilities</i></p> <ul style="list-style-type: none"> <li>Improved coordination with local governments assuring funding for primary and secondary facility renovations</li> </ul> <p><i>Health Technology Policy (HTP)</i></p> <ul style="list-style-type: none"> <li>HTP for rational use of medical devices</li> <li>HTP purchase of high technology devices</li> </ul> <p><b>Application: Find Cost of desired health interventions to determine best investment:</b></p> <p><i>EBM CPGs</i></p> <ul style="list-style-type: none"> <li>Ideal (6): Adult Finnish Lung Health Program</li> <li>Actual (6): Acute Bronchitis, Bronchial Asthma, TB, COPD, Pneumonia, and ARVI</li> </ul> <p><i>Gaps Analysis</i></p> <ul style="list-style-type: none"> <li>5 sites in urban/ rural areas, primary/secondary</li> <li>Cost analysis compared ideal/actual CPGs</li> <li>Pre-post provider training showed cost-effectiveness of EBM</li> <li>Providers began to reduce unnecessary tests, staff, and drugs</li> <li>Facilities begin to ensure/share vital medical devices for testing</li> </ul> <p><i>National Use</i></p> <ul style="list-style-type: none"> <li>MoH began to use ideal CPG costs to reimburse treatment across the country through the national Health Insurance Fund</li> </ul>

Mozambique 2001-2003	<p><b>Optimize health provider resource planning and utilization:</b></p> <p><i>Implementation</i></p> <ul style="list-style-type: none"> <li>Team: Established in MoH Planning Group</li> <li>Levels/Venues: Primary, secondary, urban/rural</li> <li>CPGs: MPS, Malaria, TB, STD e.g., HIV</li> </ul> <p><i>Key Finding</i></p> <ul style="list-style-type: none"> <li>Demonstrated cost HIV Voluntary counseling and testing (VCT) \$24 USD/encounter, not \$11 per encounter used to build 35 rural clinics</li> <li>Incomplete resource planning (re staffing and facilities) delayed access for an important segment of this population</li> </ul>
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Namibia 2002-2004	<p><b>Optimize health provider resource planning and utilization:</b></p> <p><i>Implementation</i></p> <ul style="list-style-type: none"> <li>EHTP Team: established-MoH Quality Group</li> <li>Levels/Venues: 3 key Rural District Hospitals - primary/secondary</li> <li>CPGs: Mapped 13 from MPS (C-Section, normal delivery); IMCI (including Acute Respiratory Illnesses &amp; Diarrhea); Malaria, TB</li> </ul> <p><i>Key Findings</i></p> <ul style="list-style-type: none"> <li>Gaps Analysis: Ideal CPGs based on national norms versus Actual District CPGs demonstrated significant resource efficiencies</li> </ul> <p><b>Provide key HTM indicators:</b></p> <ul style="list-style-type: none"> <li>HQ/HTM indicators selected: <ul style="list-style-type: none"> <li>Care/utilization: Maternal mortality rate, % use of CPGs, hospital admits, reduction in admits for post-natal complications</li> <li>Service: wait times, service cancellations re staff unavailability</li> <li>Human resources: patient-nurse ratio, decreased overtime payments</li> <li>Drugs: changes in pharmaceutical budget</li> <li>Devices: diagnostic tests requested, reduced referrals due to unavailable technologies (e.g., x-ray), reduced device procurement times</li> </ul> </li> </ul>
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TABLE 3B

EHTP HEALTH TECHNOLOGY MANAGEMENT IMPACTS

Site	Objectives and HQ/HTM Results		<p><b>Optimize health provider resource planning and utilization:</b> <i>Levels/Venues</i></p> <ul style="list-style-type: none"> <li>▪ District level (primary/secondary healthcare)</li> <li>▪ Focus on Mother and Child Health (MPS and IMCI) and other key support areas; e.g. surgical services, radiology, laboratory and oral health</li> <li>▪ Focus on a few selected core interventions</li> </ul> <p><b>Cost key health interventions to determine best investment:</b> <i>CPGs</i></p> <ul style="list-style-type: none"> <li>▪ Primary/Secondary level: MPS (4), HIV (12), Eye (2), Pneumonia, Physiotherapy (2), TB (2), Acute Sinusitis, Pressure Sores, Diarrhea</li> <li>▪ Conducted province Gaps Analysis for MPS care</li> </ul> <p><b>Calculate recurrent costs, and other HTM indicators:</b> <i>HTM</i></p> <ul style="list-style-type: none"> <li>▪ Conducted national HT Audit for medical devices</li> <li>▪ Conducted national Scoping Study re device HT management requirements and recommendations including staffing model &amp; regulatory framework</li> </ul>
<p><b>Peoples Republic of China</b> <b>2002-2004</b></p>	<p><b>Optimize health provider resource planning and utilization:</b> <i>Planning</i></p> <ul style="list-style-type: none"> <li>▪ Systematic “country situation” analysis of a provincial health system</li> <li>▪ Improving regional HT policies for resource planning</li> <li>▪ Optimizing costing for medical insurance – chronic and catastrophic</li> <li>▪ Note increasing prevalence of cancer, cardiovascular, and respiratory diseases</li> </ul> <p><i>HTM</i></p> <ul style="list-style-type: none"> <li>▪ Developing an appropriate HTM info system</li> <li>▪ Improving high technology medical device selection and purchase processes</li> <li>▪ Ensuring appropriate device user training</li> <li>▪ Calculating recurrent costs (device maintenance)</li> <li>▪ Enhancing medical device maintenance and life cycle management capability</li> </ul> <p><i>Implementation:</i> Overseen by Fudan University Health Technology Assessment &amp; Research Center, Shanghai</p> <ul style="list-style-type: none"> <li>▪ Levels/Venues: Nine tertiary hospitals in 3 large cities in Zhejiang Province: district secondary hospital, just south of Shanghai</li> <li>▪ CPGs <ul style="list-style-type: none"> <li>▪ Tertiary level: Gallstones, Stroke</li> <li>▪ Secondary level: Orthopedics: (1) Fracture long bone of 4 limbs, (2) Lumbar inter-vertebral disc protrusion, (3) Open injury of finger, (4) Fracture of lumbar vertebra</li> <li>▪ Local “Actual” CPGs compared to national “Ideal” CPGs from Shanghai</li> </ul> </li> </ul> <p><b>Provide key HTM indicators:</b></p> <ul style="list-style-type: none"> <li>▪ Conducted Health Technology Audit for medical devices re: Costs, Utilization, Functionality, required consumables, HTM structure, maintenance history</li> </ul> <p><i>Outcomes</i></p> <ul style="list-style-type: none"> <li>▪ Strengthened HT management system in one province, including subsystem for medical device maintenance</li> <li>▪ Gaps analysis re Orthopedics CPGs and national norms</li> <li>▪ Noted links between quality of HT management and health quality and efficiency of care delivery</li> <li>▪ Gave clear direction on how to extend the benefits of the project to other provinces of China</li> </ul>	<p><b>South Africa</b> <b>2002-2005</b></p>	<p><b>Optimize health provider resource planning and utilization:</b> <i>Venue/CPGs</i></p> <ul style="list-style-type: none"> <li>▪ Secondary and Tertiary care in Lutsk: Volyn Regional Children’s Territorial Medical Center</li> <li>▪ Necrotizing enterocolitis of fetus and newborn</li> <li>▪ Anemia during prematurity</li> </ul> <p><b>Improve HTM:</b> <i>HT Impacts</i></p> <ul style="list-style-type: none"> <li>▪ Changed HT management style from vertical “top down” to horizontal/“integrated” re health resources; with structure changes</li> <li>▪ Prioritized acquisition of needed equipment and focus on key drugs</li> </ul>